SEQUENCE LISTING

<110> FIEBIG, HELMUT
NANDY, ANDREAS
CROMWELL, OLIVER

<120> DNA SEQUENCE, AND RECOMBINANT PREPARATION OF GROUP 4 MAJOR ALLERGENS FROM CEREALS

<130> MERCK-3178

<140> 10/583,089
<141> 2006-06-15

<150> PCT/EP04/013664
<151> 2004-12-01

<150> DE 10359351.9
<151> 2003-12-16

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<170> PatentIn Ver. 3.3

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  1               5                  10                  15

caa gcc gcc gcg gcc gcc tac gcg ccc gtg cct gcc aag gcg gac ttc   96
Gln Ala Ala Ala Ala Ala Tyr Ala Pro Val Pro Ala Lys Ala Asp Phe
            20                  25                  30

ctc gga tgc ctc atg aag gag ata ccg gcc cgc ctc ctc tac gcc aag   144
Leu Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys
         35                  40                  45

agc tcg cct gac tac ccc acc gtg ctg gcg cag acc atc agg aac tcg   192
Ser Ser Pro Asp Tyr Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser
     50                  55                  60

cgg tgg tcg tcg ccg cag aac gtg aag ccg atc tac atc atc acc ccc   240
Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Ile Tyr Ile Ile Thr Pro
 65                  70                  75                  80

acc aac gcc tcg cac atc cag tcc gcg gtg gtg tgc ggc cgc cgg cac   288
Thr Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His
                85                  90                  95
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ggc atc cgc ctc cgc gtg cgg agc ggc ggc cac gac tac gag ggc ctg   336
Gly Ile Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu
            100                 105                 110

tcg tac cgg tct gag aaa ccc gag acg ttc gcc gtc gtc gac ctc aac   384
Ser Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn
        115                 120                 125

aag atg cgg gca gtg tcg gtc gac ggc tac gcc cgc acg gcg tgg gtc   432
Lys Met Arg Ala Val Ser Val Asp Gly Tyr Ala Arg Thr Ala Trp Val
    130                 135                 140

gaa tcc ggc gcg cag ctc ggc gag ctc tac tac gcg atc gcc aag aac   480
Glu Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn
145                 150                 155                 160

agc ccc gtg ctc gcg ttc ccg gct ggc gtc tgc ccg tcc atc ggc gtc   528
Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val
                165                 170                 175

ggc ggc aac ttc gca ggc ggc ggc ttt ggc atg ctg ctg cgc aag tac   576
Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr
            180                 185                 190

ggc atc gcc gct gag aac gtc atc gac gtc aag gtg gtc gac ccc aac   624
Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn
        195                 200                 205

ggc aag ctg ctc gac aag agc tcc atg agc gcg gac cac ttc tgg gcc   672
Gly Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala
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gtt agg ggc ggc ggc gga gag agc ttt ggc atc gtc gtc tcg tgg cag   720
Val Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln
225                 230                 235                 240

gtg aag ctc ctg ccg gtg cct ccc acc gtg acc gtg ctc aag atc ccc   768
Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Leu Lys Ile Pro
                245                 250                 255

aag acg gtg caa gaa ggc gcc ata gac ctc gtc aac aag tgg cag ctg   816
Lys Thr Val Gln Glu Gly Ala Ile Asp Leu Val Asn Lys Trp Gln Leu
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gtc ggg ccg gca ctt ccc ggc gac ctc atg atc cgc atc atc ctt gcc   864
Val Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Ile Ile Leu Ala
        275                 280                 285

ggg aac agc gcg acg ttc gag gcc atg tac ctg ggc acc tgc agt acc   912
Gly Asn Ser Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Ser Thr
    290                 295                 300

ctg acg ccg ctg atg agc agc aaa ttc ccc gag ctt ggc atg aac ccc   960
Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro
305                 310                 315                 320
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tcg cac tgc aac gag atg tcc tgg atc aag tcc atc ccc ttc atc cac   1008
Ser His Cys Asn Glu Met Ser Trp Ile Lys Ser Ile Pro Phe Ile His
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ctc ggc aag cag aac ctc gac gac ctc ctc aac cgg aac aac acc ttc   1056
Leu Gly Lys Gln Asn Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe
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aaa cca ttc gcc gaa tac aag tcg gac tac gtg tac cag ccc ttc ccc   1104
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        355                 360                 365

aag ccc gtg tgg gag cag atc ttc ggc tgg ctt gtg aag ccc ggc gcg   1152
Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Val Lys Pro Gly Ala
    370                 375                 380

ggg atc atg atc atg gac ccc tat ggc gcc acc atc agc gct acc ccc   1200
Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

gaa gcg gcg acg ccg ttc cct cac cgc cag ggc gtc ctc ttc aac atc   1248
Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

cag tac gtc aac tac tgg ttc gct gag tca gcc ggc gcg gcg ccg ctg   1296
Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ser Ala Gly Ala Ala Pro Leu
            420                 425                 430

cag tgg agc aag gac ata tac aag ttc atg gag ccg tac gtg agc aaa   1344
Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

aat ccc agg cag gcg tat gcc aac tac agg gac atc gac ctt ggc agg   1392
Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460

aat gag gtg gtg aac gac atc tcc acc tac agc agc ggc aaa gtg tgg   1440
Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480

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Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys
                485                 490                 495

ggc aag gtg gat cct cag gac tac ttc agg aac gag cag agc atc ccg   1536
Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
            500                 505                 510

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<213> Secale cereale

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            20                  25                  30

Leu Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys
        35                  40                  45

Ser Ser Pro Asp Tyr Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser
    50                  55                  60

Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Ile Tyr Ile Ile Thr Pro
65                  70                  75                  80

Thr Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His
                85                  90                  95

Gly Ile Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu
            100                 105                 110

Ser Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn
        115                 120                 125

Lys Met Arg Ala Val Ser Val Asp Gly Tyr Ala Arg Thr Ala Trp Val
    130                 135                 140

Glu Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn
145                 150                 155                 160

Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val
                165                 170                 175

Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr
            180                 185                 190

Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn
        195                 200                 205

Gly Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala
    210                 215                 220

Val Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln
225                 230                 235                 240

Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Leu Lys Ile Pro
                245                 250                 255

Lys Thr Val Gln Glu Gly Ala Ile Asp Leu Val Asn Lys Trp Gln Leu
            260                 265                 270
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Val Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Ile Ile Leu Ala
        275                 280                 285

Gly Asn Ser Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Ser Thr
    290                 295                 300

Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro
305                 310                 315                 320

Ser His Cys Asn Glu Met Ser Trp Ile Lys Ser Ile Pro Phe Ile His
                325                 330                 335

Leu Gly Lys Gln Asn Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe
            340                 345                 350

Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
        355                 360                 365

Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Val Lys Pro Gly Ala
    370                 375                 380

Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ser Ala Gly Ala Ala Pro Leu
            420                 425                 430

Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460

Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480

Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys
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            500                 505                 510

Pro Leu Val Glu Lys Tyr
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  1               5                  10                  15

tgc cac gcc gcc gtc tcc tac gcg gcg gcg ccg gtg ccg gcc aag gag   96
Cys His Ala Ala Val Ser Tyr Ala Ala Ala Pro Val Pro Ala Lys Glu
             20                  25                  30

gac ttc ttc gga tgc ctg gtg aag gag ata ccg gcc cgc ctc ctc tac   144
Asp Phe Phe Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Tyr
         35                  40                  45

gcc aag agc tcg cct gcc ttc ccc acc gtc ctg gcg cag acc atc agg   192
Ala Lys Ser Ser Pro Ala Phe Pro Thr Val Leu Ala Gln Thr Ile Arg
     50                  55                  60

aac tcg cgg tgg tcg tcg ccg cag agc gtg aag ccg ctc tac atc atc   240
Asn Ser Arg Trp Ser Ser Pro Gln Ser Val Lys Pro Leu Tyr Ile Ile
 65                  70                  75                  80

acc ccc acc aac gcc tcc cac atc cag tcc gcg gtg gtg tgc ggc cgc   288
Thr Pro Thr Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg
                 85                  90                  95

cgg cac ggc gtc cgc atc cgc gtg cgg agc ggc ggc cac gac tac gag   336
Arg His Gly Val Arg Ile Arg Val Arg Ser Gly Gly His Asp Tyr Glu
            100                 105                 110

ggc ctg tcg tac cgg tcc gag cgc ccc gag gcg ttc gcc gtc gtc gac   384
Gly Leu Ser Tyr Arg Ser Glu Arg Pro Glu Ala Phe Ala Val Val Asp
        115                 120                 125

ctc aac aag atg cgg gcc gtg gtg gtc gac ggc aag gct cgc acg gcg   432
Leu Asn Lys Met Arg Ala Val Val Val Asp Gly Lys Ala Arg Thr Ala
    130                 135                 140

tgg gtg gac tcc ggt gcg cag ctc ggc gag ctc tac tac gcc atc gcc   480
Trp Val Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala
145                 150                 155                 160

aag aac agc ccc gtg ctc gcg ttc ccg gcc ggc gtt tgc ccg acc att   528
Lys Asn Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile
                165                 170                 175

ggt gta ggc ggc aac ttc gct ggc ggc ggc ttc ggc atg ctg ctg cgc   576
Gly Val Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg
            180                 185                 190

aag tac ggc atc gcc gcc gag aac gtc atc gac gtg aag gtg gtc gac   624
Lys Tyr Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp
        195                 200                 205

gcc aac ggc aca ctg ctc gac aag agc tcc atg agc gcg gat cac ttc   672
Ala Asn Gly Thr Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe
    210                 215                 220
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tgg gcc gtc agg ggc ggc ggc gga gag agc ttc ggc atc gtc gtg tcg   720
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225                 230                 235                 240

tgg cag gtg aag ctc ctc ccg gtg cct ccc acc gtg acc gtg ttc aag   768
Trp Gln Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Lys
                245                 250                 255

atc ccc aag acg gtg caa gaa ggc gcc gta gag ctc atc aac aag tgg   816
Ile Pro Lys Thr Val Gln Glu Gly Ala Val Glu Leu Ile Asn Lys Trp
            260                 265                 270

cag cta gtc gcg ccg gcc ctc ccc gac gac ctg atg atc cgc atc atc   864
Gln Leu Val Ala Pro Ala Leu Pro Asp Asp Leu Met Ile Arg Ile Ile
        275                 280                 285

gct ttc ggc ggc acc gcc aag ttc gag gcc atg tac ctg ggc acc tgc   912
Ala Phe Gly Gly Thr Ala Lys Phe Glu Ala Met Tyr Leu Gly Thr Cys
    290                 295                 300

aaa gcc ctg aca ccg ctg atg agc agc aga ttc ccc gag ctc ggc atg   960
Lys Ala Leu Thr Pro Leu Met Ser Ser Arg Phe Pro Glu Leu Gly Met
305                 310                 315                 320

aac gcc tcg cac tgc aac gag atg ccc tgg atc aag tcc gtc cca ttc   1008
Asn Ala Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe
                325                 330                 335

atc cac ctt ggc aag cag gcc acc ctc tcc gac ctc ctc aac cgg aac   1056
Ile His Leu Gly Lys Gln Ala Thr Leu Ser Asp Leu Leu Asn Arg Asn
            340                 345                 350

aac acc ttc aaa ccc ttc gcc gag tac aag tcg gac tac gtc tac cag   1104
Asn Thr Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln
        355                 360                 365

ccc gtc ccc aag ccc gtc tgg gcg cag atc ttc gtc tgg ctc gtc aaa   1152
Pro Val Pro Lys Pro Val Trp Ala Gln Ile Phe Val Trp Leu Val Lys
    370                 375                 380

ccc ggc gcc ggg atc atg gtc atg gac ccc tac ggc gcc gcc atc agc   1200
Pro Gly Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Ala Ile Ser
385                 390                 395                 400

gcc acc ccc gaa gcc gcc acg ccg ttc cct cac cgc aag gac gtc ctc   1248
Ala Thr Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Asp Val Leu
                405                 410                 415

ttc aac atc cag tac gtc aac tac tgg ttc gac gag gca ggc ggc gcc   1296
Phe Asn Ile Gln Tyr Val Asn Tyr Trp Phe Asp Glu Ala Gly Gly Ala
            420                 425                 430

gcg ccg ctg cag tgg agc aag gac atg tac agg ttc atg gag ccg tac   1344
Ala Pro Leu Gln Trp Ser Lys Asp Met Tyr Arg Phe Met Glu Pro Tyr
        435                 440                 445
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gtc agc aag aac ccc aga cag gcc tac gcc aac tac agg gac atc gac   1392
Val Ser Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp
    450                 455                 460

ctc ggc agg aac gag gtg gtc aac gac atc tcc acc tat gcc agc ggc   1440
Leu Gly Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ala Ser Gly
465                 470                 475                 480

aag gtc tgg ggc gag aag tac ttc aag ggc aac ttc caa agg ctc gcc   1488
Lys Val Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala
                485                 490                 495

att acc aag ggc aag gtg gat cct cag gac tac ttc agg aac gag cag   1536
Ile Thr Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln
            500                 505                 510

agc atc ccg ccg ctg cta ggg aag tag tagtactctt gcttgcatgg         1583
Ser Ile Pro Pro Leu Leu Gly Lys
        515                 520

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             20                  25                  30

Asp Phe Phe Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Tyr
         35                  40                  45

Ala Lys Ser Ser Pro Ala Phe Pro Thr Val Leu Ala Gln Thr Ile Arg
     50                  55                  60

Asn Ser Arg Trp Ser Ser Pro Gln Ser Val Lys Pro Leu Tyr Ile Ile
 65                  70                  75                  80

Thr Pro Thr Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg
                 85                  90                  95

Arg His Gly Val Arg Ile Arg Val Arg Ser Gly Gly His Asp Tyr Glu
            100                 105                 110

Gly Leu Ser Tyr Arg Ser Glu Arg Pro Glu Ala Phe Ala Val Val Asp
        115                 120                 125

Leu Asn Lys Met Arg Ala Val Val Val Asp Gly Lys Ala Arg Thr Ala
    130                 135                 140
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Trp Val Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala
145                 150                 155                 160

Lys Asn Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile
                165                 170                 175

Gly Val Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg
            180                 185                 190

Lys Tyr Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp
        195                 200                 205

Ala Asn Gly Thr Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe
    210                 215                 220

Trp Ala Val Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser
225                 230                 235                 240

Trp Gln Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Lys
                245                 250                 255

Ile Pro Lys Thr Val Gln Glu Gly Ala Val Glu Leu Ile Asn Lys Trp
            260                 265                 270

Gln Leu Val Ala Pro Ala Leu Pro Asp Asp Leu Met Ile Arg Ile Ile
        275                 280                 285

Ala Phe Gly Gly Thr Ala Lys Phe Glu Ala Met Tyr Leu Gly Thr Cys
    290                 295                 300

Lys Ala Leu Thr Pro Leu Met Ser Ser Arg Phe Pro Glu Leu Gly Met
305                 310                 315                 320

Asn Ala Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe
                325                 330                 335

Ile His Leu Gly Lys Gln Ala Thr Leu Ser Asp Leu Leu Asn Arg Asn
            340                 345                 350

Asn Thr Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln
        355                 360                 365

Pro Val Pro Lys Pro Val Trp Ala Gln Ile Phe Val Trp Leu Val Lys
    370                 375                 380

Pro Gly Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Ala Ile Ser
385                 390                 395                 400

Ala Thr Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Asp Val Leu
                405                 410                 415

Phe Asn Ile Gln Tyr Val Asn Tyr Trp Phe Asp Glu Ala Gly Gly Ala
            420                 425                 430

Ala Pro Leu Gln Trp Ser Lys Asp Met Tyr Arg Phe Met Glu Pro Tyr
        435                 440                 445
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Val Ser Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp
    450                 455                 460

Leu Gly Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ala Ser Gly
465                 470                 475                 480

Lys Val Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala
                485                 490                 495

Ile Thr Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln
            500                 505                 510

Ser Ile Pro Pro Leu Leu Gly Lys
        515                 520
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  1               5                  10                  15

cac cac gct gcc gtc tcc tcc gcg cag gtg ccg gcc aag gac gac ttc   96
His His Ala Ala Val Ser Ser Ala Gln Val Pro Ala Lys Asp Asp Phe
             20                  25                  30

ctg gga tgc ctc gtg aag gag ata ccg gcc cgc ctc ctc ttc gcc aag   144
Leu Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Phe Ala Lys
         35                  40                  45

agc tcg cct gcc ttc ccc gcc gtc ctg gag cag acc atc agg aac tcg   192
Ser Ser Pro Ala Phe Pro Ala Val Leu Glu Gln Thr Ile Arg Asn Ser
     50                  55                  60

cgg tgg tcg tcg ccg cag aac gtg aag ccg ctc tac atc atc acc ccc   240
Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro
 65                  70                  75                  80

acc aac acc tcc cac atc cag tct gct gtg gtg tgc ggc cgc cgg cac   288
Thr Asn Thr Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His
                 85                  90                  95

ggc gtc cgc ctc cgc gtg cgg agc ggc ggc cac gac tac gag ggc ctg   336
Gly Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu
            100                 105                 110
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tcg tac cgg tcc gag cgc ccc gag gcg ttc gcc gtc gta gac ctc aac   384
Ser Tyr Arg Ser Glu Arg Pro Glu Ala Phe Ala Val Val Asp Leu Asn
        115                 120                 125

aag atg cgg acc gtg ttg gtc aac gaa aag gcc cgc acg gcg tgg gtg   432
Lys Met Arg Thr Val Leu Val Asn Glu Lys Ala Arg Thr Ala Trp Val
    130                 135                 140

gac tcc ggc gcg cag ctc ggc gag ctc tac tac gcc atc gcc aag aac   480
Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn
145                 150                 155                 160

agc ccc gtg ctc gcg ttc cca gcc ggc gtt tgc ccg tcc att ggt gta   528
Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val
                165                 170                 175

ggt ggc aac ttc gct ggc ggc ggc ttc ggc atg ctg ctg cgc aag tac   576
Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr
            180                 185                 190

ggc atc gcc gcc gag aac gtc atc gac gtc aag ctg gtc gac gcc aac   624
Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn
        195                 200                 205

ggc aag ctg ctc gac aag agc tcc atg agc ccg gac cac ttc tgg gcc   672
Gly Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala
    210                 215                 220

gtc agg ggc ggc ggc gga gag agc ttc ggc atc gtc gtc tcg tgg cag   720
Val Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln
225                 230                 235                 240

gtg aag ctt ctc ccg gtg cct ccc acc gtg act gtg ttt cag atc ccc   768
Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Gln Ile Pro
                245                 250                 255

aag aca gtg caa gaa ggc gcc gta gac ctc atc aac aag tgg cag ctg   816
Lys Thr Val Gln Glu Gly Ala Val Asp Leu Ile Asn Lys Trp Gln Leu
            260                 265                 270

gtc gcg ccg gcc ctt ccc ggc gac atc atg atc cgc atc atc gcc atg   864
Val Ala Pro Ala Leu Pro Gly Asp Ile Met Ile Arg Ile Ile Ala Met
        275                 280                 285

ggg gac aaa gcg acg ttc gag gcc atg tac ctg ggc acc tgc aaa acc   912
Gly Asp Lys Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr
    290                 295                 300

ctg acg ccg ctg atg agc agc aaa ttc ccg gag ctt ggc atg aac ccc   960
Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro
305                 310                 315                 320

tcg cac tgc aac gag atg ccc tgg atc aag tcc atc ccc ttc atc cac   1008
Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His
                325                 330                 335
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ctt ggc aag cag gcc acc ctg gcc gac ctc ctc aac cgg aac aac acc   1056
Leu Gly Lys Gln Ala Thr Leu Ala Asp Leu Leu Asn Arg Asn Asn Thr
            340                 345                 350

ttc aaa ccc ttc gcc gaa tac aag tcg gac tac gtc tac cag ccc gtc   1104
Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Val
        355                 360                 365

ccc aag ccc gtg tgg gag cag ctc ttc ggc tgg ctc acg aaa ccc ggc   1152
Pro Lys Pro Val Trp Glu Gln Leu Phe Gly Trp Leu Thr Lys Pro Gly
    370                 375                 380

gcg ggg atc atg gtc atg gac cca tac ggc gcc acc atc agc gcc acc   1200
Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr
385                 390                 395                 400

ccc gaa gcg gcg acg ccg ttc cct cac cgc aag ggc gtc ctc ttc aac   1248
Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn
                405                 410                 415

atc cag tac gtc aac tac tgg ttc gcc gag gca gcc ggc gcc gcg ccg   1296
Ile Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Gly Ala Ala Pro
            420                 425                 430

ctg cag tgg agc aag gac att tac aaa ttc atg gag ccg ttc gtg agc   1344
Leu Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Phe Val Ser
        435                 440                 445

aag aac ccc agg cag gcg tac gcc aac tac agg gac atc gac ctc ggc   1392
Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly
    450                 455                 460

agg aac gag gtg gtg aac gac atc tca acc tac agc agc ggc aag gtg   1440
Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val
465                 470                 475                 480

tgg ggc gag aag tac ttc aag ggc aac ttc caa agg ctc gcc atc acc   1488
Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr
                485                 490                 495

aag ggc aag gtg gat ccc cag gac tac ttc agg aac gag cag agc atc   1536
Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile
            500                 505                 510

ccg ccg ctg ctg ggc aag tag tgaccgagag tcttgcatgg agatttgtag      1587
Pro Pro Leu Leu Gly Lys
        515

tgcgtgcttg gcgtttctga t                                          1608
```

<210> 6
<211> 518
<212> PRT
<213> Hordeum vulgare

<400> 6

```
Ser Ser Arg Ala Phe Ala Leu Val Leu Leu Leu Cys Ala Leu Ser Cys
  1               5                  10                  15

His His Ala Ala Val Ser Ser Ala Gln Val Pro Ala Lys Asp Asp Phe
             20                  25                  30

Leu Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Phe Ala Lys
         35                  40                  45

Ser Ser Pro Ala Phe Pro Ala Val Leu Glu Gln Thr Ile Arg Asn Ser
     50                  55                  60

Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro
 65                  70                  75                  80

Thr Asn Thr Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His
                 85                  90                  95

Gly Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu
            100                 105                 110

Ser Tyr Arg Ser Glu Arg Pro Glu Ala Phe Ala Val Val Asp Leu Asn
        115                 120                 125

Lys Met Arg Thr Val Leu Val Asn Glu Lys Ala Arg Thr Ala Trp Val
    130                 135                 140

Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn
145                 150                 155                 160

Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val
                165                 170                 175

Gly Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr
            180                 185                 190

Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn
        195                 200                 205

Gly Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala
    210                 215                 220

Val Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln
225                 230                 235                 240

Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Gln Ile Pro
                245                 250                 255

Lys Thr Val Gln Glu Gly Ala Val Asp Leu Ile Asn Lys Trp Gln Leu
            260                 265                 270

Val Ala Pro Ala Leu Pro Gly Asp Ile Met Ile Arg Ile Ile Ala Met
        275                 280                 285

Gly Asp Lys Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr
    290                 295                 300
```

```
Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro
305                 310                 315                 320

Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His
                325                 330                 335

Leu Gly Lys Gln Ala Thr Leu Ala Asp Leu Leu Asn Arg Asn Asn Thr
            340                 345                 350

Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Val
        355                 360                 365

Pro Lys Pro Val Trp Glu Gln Leu Phe Gly Trp Leu Thr Lys Pro Gly
    370                 375                 380

Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr
385                 390                 395                 400

Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn
                405                 410                 415

Ile Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Gly Ala Ala Pro
            420                 425                 430

Leu Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Phe Val Ser
        435                 440                 445

Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly
    450                 455                 460

Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val
465                 470                 475                 480

Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr
                485                 490                 495

Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile
            500                 505                 510

Pro Pro Leu Leu Gly Lys
        515
```

<210> 7
<211> 1603
<212> DNA
<213> Triticum aestivum

<220>
<221> CDS
<222> (1)..(1557)

<400> 7

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aac tat agg gcc ttc acg ctg gtg ctc ctc ttc tgc gcc ttg tcc tgt   48
Asn Tyr Arg Ala Phe Thr Leu Val Leu Leu Phe Cys Ala Leu Ser Cys
  1               5                  10                  15
```

```
caa gcc gcc gcc acc tac gcg ccg gtg cct gcc aag gag gac ttc ctc   96
Gln Ala Ala Ala Thr Tyr Ala Pro Val Pro Ala Lys Glu Asp Phe Leu
             20                  25                  30

gga tgc ctc atg aag gag ata ccg gca cgc ctc ctc tac gcc aag agc  144
Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser
         35                  40                  45

tcg cct gac ttc ccc acc gtc ctg gcg cag acc atc agg aac tcg cgg  192
Ser Pro Asp Phe Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg
     50                  55                  60

tgg ttg tcg ccg cag aac gtg aag ccg ctc tac atc atc acc ccc acc  240
Trp Leu Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr
 65                  70                  75                  80

aac gcc tcg cac atc cag tcc gcg gtg gtg tgc gga cgc cgg cac agc  288
Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser
                 85                  90                  95

gtc cgc ctc cgc gtc cgg agc ggc ggc cac gac tac gag ggc ctg tcg  336
Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser
            100                 105                 110

tac cgg tcc gag aaa ccc gag acg ttc gcc gtc gtc gac ctc aac aag  384
Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
        115                 120                 125

atg cgg gca gtg ttg atc gac ggc tac gcc cgc acg gcg tgg gtc gaa  432
Met Arg Ala Val Leu Ile Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
    130                 135                 140

tcc ggc gcg cag ctc ggc gag ctc tac tac gcc atc gcg aaa aac agc  480
Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145                 150                 155                 160

ccc gtg ctc gcg ttc ccg gcc ggc gtc tgc ccg acc atc ggc gtc ggc  528
Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly
                165                 170                 175

ggc aac ttc gca ggc ggc ggc ttt ggc atg ctg ctg cgg aag tac ggc  576
Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
            180                 185                 190

atc gcc gcc gag aac gtc atc gac gtc aag gtg gtc gac ccc aac ggc  624
Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn Gly
        195                 200                 205

aag ctt ctc gac aag agc tcc atg agc ccg gac cac ttc tgg gcc gtc  672
Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala Val
    210                 215                 220

agg ggc ggc ggc gga gag agc ttt ggc atc gtc gtg tcg tgg caa gtg  720
Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225                 230                 235                 240
```

```
aag ctc ctg ccg gtg cct ccc acc gtg acc gtg ttc aag atc ccc aag   768
Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
                245                 250                 255

aca gtg caa gaa ggc gcc gta gac ctc gtc aac aag tgg caa ctg gtc   816
Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
            260                 265                 270

ggg ccg gcc ctt ccc ggc gac ctc atg atc cgc gtc atc gct gcg ggg   864
Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
        275                 280                 285

aac acc gcg aca ttc gag ggc atg tac ctg ggc acc tgc caa acc ctg   912
Asn Thr Ala Thr Phe Glu Gly Met Tyr Leu Gly Thr Cys Gln Thr Leu
    290                 295                 300

acg ccg ttg atg agc agc caa ttc ccc gag ctt ggc atg aac ccc tat   960
Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305                 310                 315                 320

cac tgc aac gag atg ccc tgg atc aag tcc atc ccc ttc atc cac ctc   1008
His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His Leu
                325                 330                 335

ggc aaa gag gcc agc ctg gtc gac ctc ctc aac cgg aac aac acc ttc   1056
Gly Lys Glu Ala Ser Leu Val Asp Leu Leu Asn Arg Asn Asn Thr Phe
            340                 345                 350

aag ccc ttc gcc gaa tac aag tcg gac tac gtg tac cag ccc ttc ccc   1104
Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
        355                 360                 365

aag ccc gtg tgg gag cag atc ttc ggc tgg ctc acg aag ccc ggt ggg   1152
Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Thr Lys Pro Gly Gly
    370                 375                 380

ggg atg atg atc atg gac cca tac ggc gcc acc atc agc gcc acc ccc   1200
Gly Met Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

gaa gcg gcg acg ccg ttc cct cac cgc cag ggc gtt ctc ttc aac atc   1248
Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

cag tac gtc aac tac tgg ttc gcc gag gca gcc gcc gcc gcg ccg ctg   1296
Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Ala Ala Ala Pro Leu
            420                 425                 430

cag tgg agc aag gac atg tac aat ttc atg gag ccg tac gtg agc aag   1344
Gln Trp Ser Lys Asp Met Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

aac ccc agg cag gcg tac gcc aac tac agg gac att gac ctc ggc agg   1392
Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460
```

```
aac gag gtg gtg aac gac atc tca acc tat agc agc ggc aag gtt tgg   1440
Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480

ggc gag aag tac ttc aag ggc aac ttc caa agg ctc gct att acc aag   1488
Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys
                485                 490                 495

ggc aag gtg gat cct cag gac tac ttc agg aac gag cag agc atc ccg   1536
Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
            500                 505                 510

ccg ctg ctc gag aag tac tga tcgaggacct tgcatggaga tttagtgcgt      1587
Pro Leu Leu Glu Lys Tyr
        515

ggttgccgtt tcacat                                                 1603
```

<210> 8
<211> 518
<212> PRT
<213> Triticum aestivum

<400> 8

```
Asn Tyr Arg Ala Phe Thr Leu Val Leu Leu Phe Cys Ala Leu Ser Cys
  1               5                  10                  15

Gln Ala Ala Ala Thr Tyr Ala Pro Val Pro Ala Lys Glu Asp Phe Leu
             20                  25                  30

Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser
         35                  40                  45

Ser Pro Asp Phe Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg
     50                  55                  60

Trp Leu Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr
 65                  70                  75                  80

Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser
                 85                  90                  95

Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser
            100                 105                 110

Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
        115                 120                 125

Met Arg Ala Val Leu Ile Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
    130                 135                 140

Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145                 150                 155                 160

Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly
                165                 170                 175
```

```
Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
            180                 185                 190

Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn Gly
        195                 200                 205

Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala Val
    210                 215                 220

Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225                 230                 235                 240

Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
                245                 250                 255

Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
            260                 265                 270

Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
        275                 280                 285

Asn Thr Ala Thr Phe Glu Gly Met Tyr Leu Gly Thr Cys Gln Thr Leu
    290                 295                 300

Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305                 310                 315                 320

His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His Leu
                325                 330                 335

Gly Lys Glu Ala Ser Leu Val Asp Leu Leu Asn Arg Asn Asn Thr Phe
            340                 345                 350

Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
        355                 360                 365

Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Thr Lys Pro Gly Gly
    370                 375                 380

Gly Met Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Ala Ala Ala Pro Leu
            420                 425                 430

Gln Trp Ser Lys Asp Met Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460

Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480
```

```
Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys
                485                 490                 495

Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
            500                 505                 510

Pro Leu Leu Glu Lys Tyr
        515
```

<210> 9
<211> 1603
<212> DNA
<213> Triticum aestivum

<220>
<221> CDS
<222> (1)..(1557)

<400> 9

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aac tgt agg gcc ttc gcg cag gtg ctc ctc ttc ttc gcc ttg tcc tgc   48
Asn Cys Arg Ala Phe Ala Gln Val Leu Leu Phe Phe Ala Leu Ser Cys
  1               5                  10                  15

caa gcc gcc gcc acc tac gcg ccg gtg cct gcc aag gag gac ttc ctc   96
Gln Ala Ala Ala Thr Tyr Ala Pro Val Pro Ala Lys Glu Asp Phe Leu
             20                  25                  30

gga tgc ctc atg aag gag ata ccg gcc cgc ctc ctc tac gcc aag agc   144
Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser
         35                  40                  45

tcg cct gac tac ccc acc gtg ctg gcg cag acc atc agg aac tcg cgg   192
Ser Pro Asp Tyr Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg
     50                  55                  60

tgg tcg acg cag cag aac gtg aag ccg ctg tac atc atc acc ccc acc   240
Trp Ser Thr Gln Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr
 65                  70                  75                  80

aac gcc tcc cac atc caa tcc gcg gtg gtg tgc ggc cgc cgg cac ggc   288
Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Gly
                85                  90                  95

gtc cgc ctc cgc gtg cgg agc ggc ggc cac gac tac gag ggc ctg tcg   336
Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser
            100                 105                 110

tac cgg tcc gag aaa ccc gag acg ttc gcc gtc gtc gac ctc aac aag   384
Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
        115                 120                 125

atg cgg gca gtg gtt gtc gac ggc tac gcc cgc acg gcg tgg gtc gaa   432
Met Arg Ala Val Val Val Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
    130                 135                 140
```

```
tcc ggc gcg cag ctc ggc gag ctc tac tac gcc atc gcg aag aac agc   480
Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145                 150                 155                 160

ccc gtg ctc gcg ttc ccg gcc ggc gtc tgc ccg tcc atc ggc gtc ggc   528
Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val Gly
                165                 170                 175

ggc aac ttc gca ggc ggc ggc ttc ggc atg ctg ctg cgc aag tac ggc   576
Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
            180                 185                 190

atc gcc gcc gag aac gtc atc gac gtc aag gtg gtc gac ccc gac ggc   624
Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asp Gly
        195                 200                 205

aag ctg ctc gac aag agc tcc atg agc gcg gac cac ttc tgg gcc gtc   672
Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala Val
    210                 215                 220

agg ggc ggc ggc gga gag agc ttc ggc atc gtc gtc tcg tgg cag gtg   720
Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225                 230                 235                 240

aag ctc atg cca gtg cct ccc acc gtc acc gtg ttt aag atc ccc aag   768
Lys Leu Met Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
                245                 250                 255

acg gtg caa gaa ggc gcc gta gac ctc gtc aac aag tgg cag ctg gtc   816
Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
            260                 265                 270

ggg ccg gca ctt ccc ggc gac ctc atg atc cgc gtc atc gct gcc ggg   864
Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
        275                 280                 285

aac acg gcg acg ttc gag gcc ttg tac ctg ggc acc tgc aaa acc ctg   912
Asn Thr Ala Thr Phe Glu Ala Leu Tyr Leu Gly Thr Cys Lys Thr Leu
    290                 295                 300

acg ccg ctg atg agc agc caa ttc ccc gag ctt ggc atg aac ccc tat   960
Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305                 310                 315                 320

cac tgc aac gag atg ccc tgg atc aag tcc gtc ccc ttc atc cac ctc   1008
His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe Ile His Leu
                325                 330                 335

ggc aaa cag gct ggc ctg gac gac ctc ctc aac cgg aac aac acc ttc   1056
Gly Lys Gln Ala Gly Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe
            340                 345                 350

aag ccc ttc gcc gaa tac aag tcg gac tac gtg tac cag ccc ttc ccc   1104
Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
        355                 360                 365
```

```
aag ccc gtg tgg gag cag atc ttc ggc tgg ctc gcg aag ccc ggc gcg   1152
Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Ala Lys Pro Gly Ala
    370                 375                 380

ggg atc atg atc atg gac ccc tac ggc gcc acc atc agc gcc acc ccc   1200
Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

gaa gcg gcg acg ccg ttc cct cac cgc cag ggc gtc ctc ttc aac atc   1248
Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

cag tat gtc aac tac tgg ttc gcc gag cca gcc ggc gcc gcg ccg ctg   1296
Gln Tyr Val Asn Tyr Trp Phe Ala Glu Pro Ala Gly Ala Ala Pro Leu
            420                 425                 430

cag tgg agc aag gac att tac aat ttc atg gag ccg tac gtg agc aag   1344
Gln Trp Ser Lys Asp Ile Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

aac ccc agg cag gcg tac gcc aac tac agg gac atc gac ctc ggc agg   1392
Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460

aat gag gtg gtg aac gac atc tca acc tac agc agc ggc aag gtg tgg   1440
Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480

ggc gag aag tac ttc aag agc aac ttc caa agg ctc gcc att acc aag   1488
Gly Glu Lys Tyr Phe Lys Ser Asn Phe Gln Arg Leu Ala Ile Thr Lys
                485                 490                 495

ggc aag gta gat cct cag gac tac ttc agg aat gag caa agc atc ccg   1536
Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
            500                 505                 510

ccg ctg atc gag aag tac tga tcgaggacct tgcatggaga tttagtgcgt      1587
Pro Leu Ile Glu Lys Tyr
        515

ggttggcgtt tcacat                                                 1603


<210> 10
<211> 518
<212> PRT
<213> Triticum aestivum

<400> 10
Asn Cys Arg Ala Phe Ala Gln Val Leu Leu Phe Phe Ala Leu Ser Cys
  1               5                  10                  15

Gln Ala Ala Ala Thr Tyr Ala Pro Val Pro Ala Lys Glu Asp Phe Leu
             20                  25                  30

Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser
         35                  40                  45
```

```
Ser Pro Asp Tyr Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg
     50                  55                  60

Trp Ser Thr Gln Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr
 65                  70                  75                  80

Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Gly
                 85                  90                  95

Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser
            100                 105                 110

Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
        115                 120                 125

Met Arg Ala Val Val Val Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
    130                 135                 140

Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145                 150                 155                 160

Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val Gly
                165                 170                 175

Gly Asn Phe Ala Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
            180                 185                 190

Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asp Gly
        195                 200                 205

Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala Val
    210                 215                 220

Arg Gly Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225                 230                 235                 240

Lys Leu Met Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
                245                 250                 255

Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
            260                 265                 270

Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
        275                 280                 285

Asn Thr Ala Thr Phe Glu Ala Leu Tyr Leu Gly Thr Cys Lys Thr Leu
    290                 295                 300

Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305                 310                 315                 320

His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe Ile His Leu
                325                 330                 335

Gly Lys Gln Ala Gly Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe
            340                 345                 350
```

```
Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
        355                 360                 365

Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Ala Lys Pro Gly Ala
    370                 375                 380

Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385                 390                 395                 400

Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
                405                 410                 415

Gln Tyr Val Asn Tyr Trp Phe Ala Glu Pro Ala Gly Ala Ala Pro Leu
            420                 425                 430

Gln Trp Ser Lys Asp Ile Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
        435                 440                 445

Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
    450                 455                 460

Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465                 470                 475                 480

Gly Glu Lys Tyr Phe Lys Ser Asn Phe Gln Arg Leu Ala Ile Thr Lys
                485                 490                 495

Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
            500                 505                 510

Pro Leu Ile Glu Lys Tyr
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<400> 11

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Tyr Phe Pro Pro Pro Ala Ala Lys Glu Asp Phe Leu Gly Cys Leu Val
  1               5                  10                  15

aaa gaa atc ccg ccg cgt ctg ttg tac gcg aaa tcg tcg ccg gcg tat   96
Lys Glu Ile Pro Pro Arg Leu Leu Tyr Ala Lys Ser Ser Pro Ala Tyr
             20                  25                  30

ccc tca gtc ctg ggg cag acc atc cgg aac tcg agg tgg tcg tcg ccg   144
Pro Ser Val Leu Gly Gln Thr Ile Arg Asn Ser Arg Trp Ser Ser Pro
         35                  40                  45
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gac aac gtg aag ccg ctc tac atc atc acc ccc acc aac gtc tcc cac   192
Asp Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr Asn Val Ser His
     50                  55                  60

atc cag tcc gcc gtg gtg tgc ggc cgc cgc cac agc gtc cgc atc cgc   240
Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser Val Arg Ile Arg
 65                  70                  75                  80

gtg cgc agc ggc ggg cac gac tac gag ggc ctc tcg tac cgg tct ttg   288
Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser Tyr Arg Ser Leu
                85                  90                  95

cag ccc gag acg ttc gcc gtc gtc gac ctc aac aag atg cgg gcg gtg   336
Gln Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys Met Arg Ala Val
            100                 105                 110

tgg gtg gac ggc aag gcc cgc acg gcg tgg gtg gac tcc ggc gcg cag   384
Trp Val Asp Gly Lys Ala Arg Thr Ala Trp Val Asp Ser Gly Ala Gln
        115                 120                 125

ctc ggc gag ctc tac tac gcc atc tat aag gcg agc ccc acg ctg gcg   432
Leu Gly Glu Leu Tyr Tyr Ala Ile Tyr Lys Ala Ser Pro Thr Leu Ala
    130                 135                 140

ttc ccg gcc ggc gtg tgc ccg acg atc gga gtg ggc ggc aac ttc gcg   480
Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly Gly Asn Phe Ala
145                 150                 155                 160

ggc ggc ggc ttc ggc atg ctg ctg cgc aag tac ggc atc gcc gcg gag   528
Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly Ile Ala Ala Glu
                165                 170                 175

aac gtc atc gac gtg aag ctc gtc gac gcc aac ggc aag ctg cac gac   576
Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn Gly Lys Leu His Asp
            180                 185                 190

aag aag tcc atg ggc gac gac cat ttc tgg gcc gtc agg ggc ggc ggg   624
Lys Lys Ser Met Gly Asp Asp His Phe Trp Ala Val Arg Gly Gly Gly
        195                 200                 205

ggc gag agc ttc ggc atc gtg gtc gcg tgg cag gtg aag ctc ctg ccg   672
Gly Glu Ser Phe Gly Ile Val Val Ala Trp Gln Val Lys Leu Leu Pro
    210                 215                 220

gtg ccg ccc acc gtg aca ata ttc aag atc tcc aag aca gtg agc gag   720
Val Pro Pro Thr Val Thr Ile Phe Lys Ile Ser Lys Thr Val Ser Glu
225                 230                 235                 240

ggc gcc gtg gac atc atc aac aag tgg caa gtg gtc gcg ccg cag ctt   768
Gly Ala Val Asp Ile Ile Asn Lys Trp Gln Val Val Ala Pro Gln Leu
                245                 250                 255

ccc gcc gac ctc atg atc cgc atc atc gcg cag ggg ccc aag gcc acg   816
Pro Ala Asp Leu Met Ile Arg Ile Ile Ala Gln Gly Pro Lys Ala Thr
            260                 265                 270
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ttc gag gcc atg tac ctc ggc acc tgc aaa acc ctg acg ccg ttg atg   864
Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr Leu Thr Pro Leu Met
        275                 280                 285

agc agc aag ttc ccg gag ctc ggc atg aac ccc tcc cac tgc aac gag   912
Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro Ser His Cys Asn Glu
    290                 295                 300

atg tca tgg atc cag tcc atc ccc ttc gtc cac ctc ggc cac agg gac   960
Met Ser Trp Ile Gln Ser Ile Pro Phe Val His Leu Gly His Arg Asp
305                 310                 315                 320

gcc ctc gag gac gac ctc ctc aac cgg aac aac tcc ttc aag ccc ttc   1008
Ala Leu Glu Asp Asp Leu Leu Asn Arg Asn Asn Ser Phe Lys Pro Phe
                325                 330                 335

gcc gaa tac aag tcc gac tac gtc tac cag ccc ttc ccc aag acc gtc   1056
Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro Lys Thr Val
            340                 345                 350

tgg gag cag atc ctc aac acc tgg ctc gtc aag ccc ggc gcc ggg atc   1104
Trp Glu Gln Ile Leu Asn Thr Trp Leu Val Lys Pro Gly Ala Gly Ile
        355                 360                 365

atg atc ttc gac ccc tac ggc gcc acc atc agc gcc acc ccg gag tcc   1152
Met Ile Phe Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro Glu Ser
    370                 375                 380

gcc acg ccc ttc cct cac cgc aag ggc gtc ctc ttc aac atc cag tac   1200
Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn Ile Gln Tyr
385                 390                 395                 400

gtc aac tac tgg ttc gcc ccg gga gcc gcc gcc gcg ccc ctc tcg tgg   1248
Val Asn Tyr Trp Phe Ala Pro Gly Ala Ala Ala Pro Leu Ser Trp
                405                 410                 415

agc aag gac atc tac aac tac atg gag ccc tac gtg agc aag aac ccc   1296
Ser Lys Asp Ile Tyr Asn Tyr Met Glu Pro Tyr Val Ser Lys Asn Pro
            420                 425                 430

agg cag gcg tac gca aac tac agg gac atc gac ctc ggc agg aac gag   1344
Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg Asn Glu
        435                 440                 445

gtg gtc aac gac gtc tcc acc tac gcc agc ggc aag gtc tgg ggc cag   1392
Val Val Asn Asp Val Ser Thr Tyr Ala Ser Gly Lys Val Trp Gly Gln
    450                 455                 460

aaa tac ttc aag ggc aac ttc gag agg ctc gcc att acc aag ggc aag   1440
Lys Tyr Phe Lys Gly Asn Phe Glu Arg Leu Ala Ile Thr Lys Gly Lys
465                 470                 475                 480

gtc gat cct acc gac tac ttc agg aac gag cag agc atc ccg ccg ctc   1488
Val Asp Pro Thr Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro Pro Leu
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Ile Lys Lys Tyr
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Lys Glu Ile Pro Pro Arg Leu Leu Tyr Ala Lys Ser Ser Pro Ala Tyr
20 25 30

Pro Ser Val Leu Gly Gln Thr Ile Arg Asn Ser Arg Trp Ser Ser Pro
35 40 45

Asp Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr Asn Val Ser His
50 55 60

Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser Val Arg Ile Arg
65 70 75 80

Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser Tyr Arg Ser Leu
85 90 95

Gln Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys Met Arg Ala Val
100 105 110

Trp Val Asp Gly Lys Ala Arg Thr Ala Trp Val Asp Ser Gly Ala Gln
115 120 125

Leu Gly Glu Leu Tyr Tyr Ala Ile Tyr Lys Ala Ser Pro Thr Leu Ala
130 135 140

Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly Gly Asn Phe Ala
145 150 155 160

Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly Ile Ala Ala Glu
165 170 175

Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn Gly Lys Leu His Asp
180 185 190

Lys Lys Ser Met Gly Asp Asp His Phe Trp Ala Val Arg Gly Gly Gly
195 200 205

Gly Glu Ser Phe Gly Ile Val Val Ala Trp Gln Val Lys Leu Leu Pro
210 215 220

Val Pro Pro Thr Val Thr Ile Phe Lys Ile Ser Lys Thr Val Ser Glu
225 230 235 240

Gly Ala Val Asp Ile Ile Asn Lys Trp Gln Val Val Ala Pro Gln Leu
245 250 255

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Pro Ala Asp Leu Met Ile Arg Ile Ile Ala Gln Gly Pro Lys Ala Thr
            260                 265                 270

Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr Leu Thr Pro Leu Met
        275                 280                 285

Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro Ser His Cys Asn Glu
    290                 295                 300

Met Ser Trp Ile Gln Ser Ile Pro Phe Val His Leu Gly His Arg Asp
305                 310                 315                 320

Ala Leu Glu Asp Asp Leu Leu Asn Arg Asn Asn Ser Phe Lys Pro Phe
                325                 330                 335

Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro Lys Thr Val
            340                 345                 350

Trp Glu Gln Ile Leu Asn Thr Trp Leu Val Lys Pro Gly Ala Gly Ile
        355                 360                 365

Met Ile Phe Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro Glu Ser
    370                 375                 380

Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn Ile Gln Tyr
385                 390                 395                 400

Val Asn Tyr Trp Phe Ala Pro Gly Ala Ala Ala Ala Pro Leu Ser Trp
                405                 410                 415

Ser Lys Asp Ile Tyr Asn Tyr Met Glu Pro Tyr Val Ser Lys Asn Pro
            420                 425                 430

Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg Asn Glu
        435                 440                 445

Val Val Asn Asp Val Ser Thr Tyr Ala Ser Gly Lys Val Trp Gly Gln
    450                 455                 460

Lys Tyr Phe Lys Gly Asn Phe Glu Arg Leu Ala Ile Thr Lys Gly Lys
465                 470                 475                 480

Val Asp Pro Thr Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro Pro Leu
                485                 490                 495

Ile Lys Lys Tyr
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<210> 14
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<400> 14
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1 5 10

<210> 15
<211> 17
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<400> 15
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1 5 10 15

Tyr

<210> 16
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<400> 16
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<210> 17
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<400> 17
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1 5 10

<210> 18
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1 5 10 15

Gln Leu Tyr Leu Lys Ser
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Glu Pro Ile Pro Lys Lys Ser
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Met Thr Pro Tyr Val Ser Lys Asn Pro Arg Gln Ala Tyr Val Asn Tyr
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Arg Asp Leu Asp
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<210> 28
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<213> Lolium perenne

<400> 28
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<210> 29
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<213> Lolium perenne

<400> 29
Gly Leu Ile Glu Phe Pro Ala Gly Val
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<210> 30
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<213> Secale cereale

<400> 30
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<210> 31
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<400> 31
accaacgcct cccacatcca gtc 23

<210> 32
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<400> 32
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<210> 35
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<400> 35
catgcttgat ccttattcta ctagttgggc 30

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<400> 37
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<400> 38
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<210> 43
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<210> 44
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